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NASA TECH BRIEF

Ames Research Center

Prediction of Aircraft Noise Source and Estimation of Noise-Level Contours

Two computer programs have been developed to aid aircraft designers who need to identify the noise characteristics of various aircraft and engine configurations; the calculated noise levels can then be compared with community goals for noise limitation. The first program is used to predict the noise generated by five basic types of aircraft: turbojet, turbofan, turboprop, V/STOL, and helicopter. The second program is used to calculate contours of equal noise level (footprints) and the area within the contours for an aircraft during takeoff and approach operations; a second version of the footprint program is compatible with a flight simulator which provides aerodynamic and engine performance data, and thus an estimate can be made of the noise exposure produced by an aircraft operation.

The first program has been generalized to accommodate several different types of noise sources associated with current and future aircraft. The noise-source prediction modules include: measured data, jet noise, core and turbine noise, compressor and fan noise, and propeller, helicopter, and tilt rotor noise. The four steps in the program which provide the flexibility required for predicting the noise from several sources are solution of flight path/observer geometry, calculation and summation of the sound levels for each source, extrapolation of the index noise spectra to the observer, and calculation of human response measures. One of the requirements of the noise prediction program is the linkage of its output, a data table, with the noise contour program. Output variables for the data table are noise level, engine performance parameter, elevation angle in degrees, and logarithm (log R) of the range at the closest point of approach.

A noise contour is the locus of points on the ground in which the noise is at a constant acoustic level; its calculation requires the establishment of the relationship between the aircraft's noise performance and the aero/propulsion parameters during takeoff and landing. The noise contour calculation can also be outlined into four basic steps: formation of the acoustic data functions, calculation of log R for a specific contour, calculation of contour points, and coordinate transformations.

Notes:

1. The programs are written in FORTRAN G for use with an IBM 360 computer. The second version of the noise contour program, for use with a flight simulator, is written in FORTRAN G for Sigma VII and VIII computers.
2. Inquiries concerning these programs should be directed to:

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